Avoiding Information Overload

by Captain Robert L. Bateman III, US Army

TIME IS A COMPONENT of the effective application of violence, which lies at the heart of the military profession. Therefore, we must understand how we operate within time, beyond mere experiential information, so that we can formulate new concepts of how we might more efficiently accomplish or threaten violence in the pursuit of tactical, operational and strategic political objectives. We seek to operate faster than any potential enemy, but to do this we need to analyze how we think about time.[1] This article offers a conceptual solution that will allow Army leaders to focus their efforts in designing systems and technology intended to increase the relative operations tempo (OPTEMPO) of US combat forces.

New technological innovations arrive weekly within the force, and we struggle to put words to new concepts. But what are the benefits of this new information access and manipulation ability? What are the potential results from all our evolving equipment and data collection dissemination advances? We know where we want to go and how we want to fight. We want to be all-knowing and all-seeing. We think this will allow us to outmaneuver the enemy by acting faster than he can; now we need to understand how we will act faster. One aspect remains constant—our doctrine will reflect our history, and this history reflects our experiences in combat.[2] There is one stumbling block in this. We have rarely addressed the concept of time beyond noting that "faster is better."

The US Army has not qualified a larger framework for the cycle that units execute to move from impetus to execution.[3] This shortfall should be corrected so that we might identify where we are, with regard to the speed of our operations, and where we might improve in the future. Through analysis and refinement of how we think about time, and how our forces move in time, we might identify the specific improvements we need to increase our OPTEMPO.

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It seems inevitable and desirable that information technology will change the very nature of how the US Army fights and operates—tactically and operationally.[4] Yet questions continue to flow in the professional journals about how these new technologies, integrated with future doctrine, should change our warfare methods. However, we are still missing a vital component in understanding how we want our new equipment to interoperate. We are missing an Army-unique approach to understanding OPTEMPO.

One conceptual approach to military operations and tempo—the "Boyd Cycle," also known as the "observe-orient-decide-act (OODA) loop—is preferred in most US Army and US Marine Corps doctrine.[5] An abbreviated less-detailed form is cited as the "IDA" cycle (information-decision-action).[6] However, given our current "Decision Cycle" model, one might conclude that future US combat operations could unfold slower than expected. Is this likely to be true, or is the model itself incomplete or irrelevant in light of new technology and the ground combat environment?

The Boyd Cycle

In the late 1970s, Air Force pilot Colonel John Boyd wanted to understand why US fighter aircraft consistently won air combat engagements against

In Lind's writing and Boyd's briefings, the OODA loop became the method used to describe the process by which ground combat formations might be able to fight the enemy more efficiently by moving quicker through the OODA loop. They postulated that if US ground commanders could see, think and then act faster than the enemy, they could, almost by definition, hit the enemy before he was ready or in a location or manner which he was not prepared to accept.

aircraft that had better maneuverability. His observations led to what is now known as the Boyd Cycle. Conventional wisdom dictated that aircraft with better maneuverability, given similar speed capabilities, should generally win most close engagements. However, this was not happening in actual air-to-air engagements. US fighters, despite wider turn radii, consistently beat opponent aircraft and pilots. Based upon an analysis of the airframes and their capabilities, Boyd came upon a subtle conclusion. It was not the turn radius that is the decisive factor in air combat, it is the ability to see the enemy and the speed with which control inputs reached control surfaces which turned the tide in singular engagements. Boyd's hypothesis was that US fighters were winning because they could complete a "loop" of action faster than enemy aircraft. Boyd's loop occurred in four distinct steps:

- Observe: Our pilots could see the enemy better and more completely due to the cockpit design of our aircraft, which had great visibility.
- Orient: Since our pilots saw the enemy first, they could react, or orient themselves toward the enemy faster.
- Decide: After seeing and instinctually reacting with an initial orientation, our pilots' level of training allowed them to decide faster on their next combat maneuver.
- Act: When US pilots input control movements to their aircraft, their inputs were more rapidly converted into control surface movements, with the resultant faster initiation of a desired maneuver.

Based on these observations, Boyd's OODA model of air-to-air combat was valid and useful to the Air Force. The model worked and accurately described that particular aspect of conflict. However, after Boyd's presentations on the OODA loop gained Air Force-wide acceptance, they also worked their way into the US ground force's inventory through a series of conceptual briefings given by Boyd and through the maneuver warfare writings of William F. Lind.

Lind, in his writings on ground combat and the role of maneuver in ground combat, latched onto Boyd's OODA cycle and used it extensively as a tool to describe how US forces might be able to more efficiently prosecute ground combat. In Lind's writing and Boyd's briefings, the OODA loop became the method used to describe the process by which ground combat formations might be able to fight the enemy more efficiently by moving quicker through the OODA loop. They postulated that if US ground commanders could see, think and then act faster than the enemy, they could, almost by definition, hit the enemy before he was ready or in a location or manner which he was not prepared to accept. There is, however, one major problem with Lind's conversion of the Boyd cycle: ground combat formations, or naval forces for that matter, are not fighter planes. While the Boyd Cycle has served as a decent conceptual framework for the past 15 years, it has also inadvertently become gospel, and its unquestioned use results in an oversimplification of the cycle facing ground force commanders.

The Boyd Cycle Revisited

Observe-orient-decide-act—a simple formula for a complex series of human actions for a fighter pilot in contact. But how well does this cycle really reflect what happens on the ground? To determine the Boyd Cycle's validity and understand its potential lessons for the future Army, we should start by dissecting the OODA loop.

Observe. For the fighter pilot this is a straightforward physical action. Either he or his aircraft's sensors detect an enemy at a given range, and this begins the air-to-air engagement. How does this equate to the ground force commander? If we replace "observe" with "intelligence gathering" or "information," we might be closer to the picture. Intelligence has a wider connotation and reflects the ongoing "observation-evaluation-confirmation process" which is intelligence. However, this is not an instant act on the ground. At the tactical level, for example, few brigade commanders since the Civil War have been able to equate a single observation with true intelligence. Today's commanders have staff sections that collect the observations of many and varied sources, match these observations to predicted values and attempt to "paint the picture" for the commander about what he is facing to his front. So, while "observation" is not an accurate description of the process that occurs for the commander to

"see," its parallel to intelligence, or more accurately "information collection," is evident and equitable.

Orient. For the fighter pilot in action, this is an almost unconscious act that immediately follows "observation." It may be the swiveling of his head or the immediate control inputs the pilot feeds to his aircraft to change its orientation, thereby gaining a more favorable attack attitude, but it is most definitely a fast and physical response to the stimuli of the opposing aircraft. This sequence step is invalid for the ground force commander. A ground force commander at battalion, brigade, division or corps does not instantly react to any observation in the manner which is intended by Boyd's original hypothesis. Nor will a naval formation. Orientation, for the unit leader's purpose, might be better placed after the next step.

Decide. The next step for the fighter pilot is "What maneuver, given the flight and weapon variables of this fight, should I execute next?" Given that he has already oriented himself, the pilot is now ready to commit his whole force (the airframe and himself) to a decisive action. He has postured unconsciously and considered the variables; now with his high state of training, he selects the optimal solution for the situation and proceeds. For the leader on the ground or at sea, this is a much slower process. We are not considering the movement of a single vehicle or element, but the synchronized actions of dozens. Whether following the Military Decision Making Process (MDMP) or simple troop-leading procedures (TLPs), "make a tentative plan" always precedes "initiate necessary movement." So "decide" should precede "orient" for an accurate model of the cycle Army leaders follow. We need to figure out where we plan to go before we start forces rolling, given our relative inertia when compared to that of a single fighter plane.

Act. This is the portion of the pilot's loop where Boyd made his discovery that based upon the internal design of our aircraft, our pilots could initiate maneuvers quicker than their opponents, even if the two completed the first three steps simultaneously. This step was the basis for a change in fighter aircraft dogfight tactics, but the problem arises when this same model, unmodified, is accepted by the Army. Our problem? Again it is one of degree. While it is well and good to say that the division headquarters publishes an operations order (OPORD) and the division attacks, this is not quite the case. What really happens, or has happened for the past 150 years, is that division (or higher echelon) issues an OPORD *which sets a cycle in motion for the next lower echelon*. This new cycle has yet to be qualified as a theoretical model. However, the implications of information-based warfare require that this new cycle be examined closely, as Force XXI tactics, techniques and procedures (TTPs) will quickly outstrip the OODA loop itself.

US Army

10th Mountain Division (Light Infantry) soldiers check their list for any last-minute details before going on a patrol, Aquin, Haiti, 1995.

"Act" is not an instantaneous event for any Army unit I have ever seen. Instead we use a series of checklists to describe the sequence in which events should generally occur to produce a successful operation. These TLPs are valid and worthy today. But in their current format, are they too cumbersome to serve as a model of what *might be* an information-based future Army? Two questions loom: "How do Army units move from decide to action?" and "Where in this cycle might Force XXI, and its attendant initiatives, have the greatest impact?"

As demonstrated above, the OODA loop must be restructured, at least for the Army and the US Marine Corps.[7] The cycle components may be valid, but their applicability to ground forces is limited in the present sequence. The cycle should be ODOA, that is; observe (gather intelligence), decide (make a tentative or complete plan based on the intelligence), orient (initiate necessary movements) and act (which has its own cycle). So, given the new ODOA sequence, what are the information warfare pitfalls this model does not address?

Today's leaders, by training and natural inclination, are decisive. It is one of our key attributes, and one which might lead us into trouble in the future. To understand why, you must dissect how and why we make decisions. Simply put, we make decisions when provided with information. Some of this information is data we look for, some is forced upon us, but the natural inclination is to

Currently we try to create the plan, then issue a warning order, gather information, create a tentative plan, complete the plan, issue the order and execute. This is a very cumbersome process. Our abilities to leap ahead of the enemy in this portion of the loop require that receipt be followed by understanding, followed very quickly by order dissemination, then execution. Digital systems might give us this ability, if we can learn to start acting in parallel. Last-minute changes in plans could then be much more profound without the traditionally associated confusion.

make a decision based upon that data. Because information requires decisions, and decisions require time, what happens to our speed through the ODOA cycle when the information potential is increased beyond available time? Do we approach infinite information requiring infinite decisions requiring infinite time? This is, of course, a gross exaggeration, but the point is valid. There are no doctrinal checks and balances upon the information potentially available to future brigade and higher-level commanders and staffs. The focus is first on getting all that information to the digital command posts (CPs), but what might happen when it arrives? A tactical scenario might look like this:

In the battle command vehicle (BCV), the battalion commander sees what his commanders on the front line cannot. As the breach is initiated and supporting fires lay a smoke screen for the engineers, the commander notices another downlink, this time from a Joint Surveillance and Target Attack Radar System (JSTARS) platform. The enemy reserve has not been pinned or delayed by the family of scatterable mines fired on their location, and are in fact moving forward from their concealed positions along an unexpected route.

Again, the commander has beaten the enemy in the OODA cycle. He orders his own reserve to move forward and occupy a position on a shelf which is over the next hill from its current location. On his command display he quickly sketches the new control graphics for the reserve company commander, hits send and orders the reserve to occupy the new blocking position. The reserve company commander protests. "What shelf?" he asks. On the small monitor inside his turret, the resolution cannot discern the gap in the contour intervals, and he is leery of placing his command in an exposed forward slope position against what to him is an unknown force.

The battalion commander knows better and repeats his orders. He has seen this ground through an unmanned aerial vehicle (UAV) and confirmed that it is an ideal location to meet the attempted flanking counterattack. From his swivel chair he turns and directs the fire support officer to place fires in the grid where he has placed his cursor. The cursor becomes a fire mission even as the enemy counterattack arrives. The breach is successful and the task force rolls on. The battalion commander has learned that information is power, and he has certainly acted upon that information with lethal effects.[8]

In this scenario the mechanized battalion commander saved the day. The unit was rolling and in contact, and through his superior information gathering and manipulation capabilities, he could step in and issue accurate and timely fragmentary orders (FRAGOs) to the base plan. But consider the potential pitfalls such actions open. Rest assured that the commander in that BCV received not only the JSTARS downloads and real-time UAV observations, but that *his* higher headquarters had the same information at the same time. What brigade commander worth his salt would not call his subordinate battalion commander with instructions? Then there is the division commander, looking two levels down, who sees on his All-Source Analysis System update that there is a significant threat to one of his battalions, and *he* adds his input to the information pouring down upon that battalion commander. The same battalion commander then has his flanking unit, which is also digitally aware of the engagements, requesting a boundary change because it has the capability to engage the counterattack as well. Finally, new information floods into that battalion CP from JSTARS or the UAV, or scouts or national reconnaissance assets. . . actions at the breach require attention, the engineers have completed the breach but there are large numbers of casualties requiring evacuation on the breach's near side. To evacuate these casualties requires some combat force to increase suppressive fires to permit the medical platoon to move forward under fire even as the penetration occurs. Only the commander can commit those combat forces. The Combat Trains Command Post (CTCP) has picked up on the situation and prepared the evac teams, but the commander now must decide whether to send all companies through now or hold one back to

suppress enemy units on the flank and allow the evacuation to proceed quickly. The issue is *not* what he should do in this scenario—the issue is that he now has four separate decisions to make immediately. All of these decisions require some amount of time greater than zero. This is where the information overload might be most keenly felt on future battlefields. It is also a scenario that points out one aspect of information warfare which has not been addressed until recently. Given our current information abilities, some commanders, although weaker in their decision making abilities, might still perform adequately. In the future, weaker commanders will fail exponentially in relation to the withering incoming information available to them.

We have now identified, but not solved, the weakness in the Boyd Cycle. Resequencing helps increase its applicability to ground force operations. But there remains that conceptual gap, where the fighter pilot alone in his aircraft *acts*, while the headquarters of a combat formation *issues directions* to act. These are not synonymous actions—one results in immediate movement of the element directed to move (the airframe), while the other results in the initiation of a second cycle. This second cycle shows where Force XXI and the revolution in military affairs (RMA) might reach maximum potential at the tactical warfare level.

The RUDE Cycle

I cannot speak for the rest of the US military, but "act" is not an instantaneous event for any Army unit I have ever seen. Instead we use a series of checklists to describe the sequence in which events should generally occur to produce a successful operation. These TLPs are valid and worthy today. But in their current format, are they too cumbersome to serve as a model of what *might be* an information-based future Army? Two questions loom: "How do Army units move from decide to action?" and "Where in this cycle might Force XXI, and its attendant initiatives, have the greatest impact?"

In the simplest model, Army units *receive* a mission, *understand* the mission, *disseminate* the mission and *execute* the mission. Remember, this is the simplest model, and each term remains flexible despite the following definitions. This is a conceptual model only, designed as a framework to assist understanding of how ground units actually execute or *act*.

Receive. There are two areas where the temporal impacts, the promised increase in OPTEMPO, might best be effected by the information revolution. The first is the *receive* phase. Receive means the actual physical process of acquiring an OPORD

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or FRAGO from a higher headquarters. Traditional 20th-century OPORDs are transmitted in person, by voice, with accompanying graphics. The OPORD and/or FRAGO format itself is not the issue—what matters is the physical process. This almost always requires the physical movement of subordinates to the higher headquarter's location. This may be by foot over 2 kilometers or by vehicle over 30. Echelon and scale are irrelevant—what matters is that the physical movement must occur, and that it takes some time greater than zero. Following the movement, the OPORD's verbal transmission, in conjunction with the written version, also takes a significant amount of time. Even the most basic FRAGO still has a verbal component that takes more time to send than a comparable amount of information in visual/text format. With the strides in computer technology, data transmission technology and simultaneous voice transmission, it is possible to transmit shared graphics, view digital photos and simultaneously conduct video and audio transmissions. This combination allows the potential for remote OPORD reception with even better quality than traditional methods offer. But reception is nothing if the receiver lacks the second component.

Understand. "A picture paints a thousand words" is a cliche for a reason—because it is true. With any operation, the fastest and most efficient method of imparting complex data to another person is through the use of visual aids. This explains in part why so many senior officers refer to themselves as "visual" people. They understand this basic fact and want to establish their incoming and outgoing information flow so that it can be understood as fast as possible. With computer and digital transmission, our ground forces have acquired the potential to use this second sense (sight) to supplant the traditional method of remote information understanding (hearing). To execute any order, a subordinate element leader

must understand exactly what mission he must execute, before he can translate that into what he specifically must accomplish. Once he has an understanding, he may disseminate information.

Disseminate. By this point, the astute reader might notice that there is no step relating specifically to the mental process which occurs at echelons between the unit being considered for the ODOA loop and those multiple units, potentially several echelons below, that actually start their engines or shoulder their rucksacks. This mental process, the military decision-making process, does not disappear. However, listing it in a sequential loop would be incorrect. Properly executed, the MDMP is a simultaneous, or near-simultaneous, and continual process executed in parallel to the ODOA-RUDE loops. In other words, planning starts and never stops. This is contrary to the current concept of sequential planning executed in accordance with the "1/3 – 2/3 Rule." If we *really* did parallel planning, why would we even have a rule like that in our doctrine? Currently we try to create the plan, then issue a warning order, gather information, create a tentative plan, complete the plan, issue the order and execute. This is a very cumbersome process. Our abilities to leap ahead of the enemy in this portion of the loop require that receipt be followed by understanding, followed very quickly by order dissemination, then execution. Digital systems might give us this ability, if we can learn to start acting in parallel. Last-minute changes in plans could then be much more profound without the traditionally associated confusion. All this stems from our ability to quickly disseminate information and orders down across several levels with minimal degradation in the understanding. This ability leads directly to, and continues through, the final step.

Execute. This familiar term means the actual moment that soldiers start moving, engines engage final drives and rounds start flying downrange. The RUDE loop, executed sequentially within each echelon, may run several iterations before actual execution. However, regardless of how many iterations a particular echelon might run, all echelons—company, battalion, division or corps—should consider that exact same moment in space/time as the *execute*. Moreover, all these command levels can "see" the same images, thereby forming a common vision of the reality of operations at the decisive point(s).

Closing the Loop

The ODOA cycle remains valid with the addition of the RUDE cycle. Boyd's perceptive grasp of a larger application to his specific observations remains as an example of great incisive thinking. Had the current RMA not occurred, induced as it was by the explosion in computer technology, modifications to the cycle might never be needed. However, as things stand today, we do need a revision. The application of the RUDE cycle may provide future planners the conceptual tools they will need to manipulate forces across space and time. Understanding exactly where the loop has increased in speed suggests to others where future improvements in our temporal capabilities might be found. In any case, the Boyd cycle still stands as one of the great theories in 20th-century military thought. With it, we may well be able to operate at "200 miles per hour" as suggested by some Army leaders.[9] ***MR***

NOTES

1. Robert Leonhard, *Fighting By Minutes, Time and the Art of War,* (Westport, CT: Praeger, 1994) 10-11. Leonhard offers numerous tools for understanding conflict from a temporal standpoint in this work. Most salient among them is that conflict occurs not just in "time" but that it also has a frequency. Noting that we do not always need to be first is an important concept. However, this article pursues the corollary that if we want to maintain our option to be first, we must be able to operate faster.

2. Allan R. Millett, "American Military History: Clio and Mars as 'Pards'" *Military History and the Military Profession*, ed. David A. Charters, Marc Milner and J. Brent Wilson (Westport, CT: Praeger Publishers, 1992) 5-9. Millett states that there are at least five kinds of military history. One of these is military-utilitarian—the deliberate use of history by the military establishment for specific purposes. One purpose Millett identifies is the role this type of history played in the creation of military doctrine. In describing the role of military history at the US School of the Line and Staff College at Fort Leavenworth, KS, Millet states, "Military history developed operational doctrine and strategic vision within the officer corps."

3. C. Kenneth Allard, *Command, Control, and the Common Defense* (New Haven, CT: Yale University Press, 1990) 150-154. Allard notes the competing concepts for visualizing of command, control, communication and intelligence put forward by both John Boyd and Joel S. Lawson. However, it should be noted that at the time of their writings, both of these men were civilians (albeit within the defense community) and more specifically, neither had roots in ground combat. Boyd being a former fighter pilot, Lawson a defense theorist focusing on naval operations.

4. Douglas Macgregor, *Breaking the Phalanx* (Westport, CT: Praeger, 1997) 31-35. Macgregor is not the only one to identify the revolution in military affairs (RMA), merely the most current. However, his ideas regarding the changes in force structure required to incorporate the advantages which the "digital revolution" might convey do differ radically from the current Army plans. Both might benefit from an analysis of deployment and deployability factors as determinants in force structure, and also how these smaller forces are expected to be faster in a relative sense, not just to their predecessor formation types, but to the enemy.

5. US Marine Corps Field Manual (FMFM)-I, *Warfighting* (Washington, DC: Department of the Navy, 1989) 30-32.

6. Ajay Singh, "Time: The New Dimension in War," *Joint Force Quarterly*, Winter 1995-96.

7. FMFM-I. The US Marine Corps also follows and uses the writings and theories of Boyd. Their base doctrine, encompassed in FMFM-I, specifically attributes to Boyd the conceptualization of the OODA loop, and cites his lectures as the method which communicated the concept to them.

8. Robert Bateman, "Force XXI and the Death of Auftragstaktik," *Armor* (Jan-Feb, 1996) 13-15.

9. Army Homepage, Gerry Gilmore, "Avoiding attrition warfare in 2020-2025, Army After Next to be fast, flexible, able to put enemy in 'checkmate' status" quoting MG Robert Scales, as it appeared on the Internet, 8 August l997.

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